What is claimed is:

1. An apparatus having a superconductor flux pump including a transformer having, on a secondary side thereof, at least one superconducting coil, and at least one controllable switch, the pump being intended for feeding current into a superconducting coil of an electromagnet, wherein the at least one superconducting coil on the secondary side of the transformer includes an HT_c superconductor material, the at least one controllable switch has a switch gap being in the form of a strip, the at least one switch at least in part includes an HT_c superconductor material, and wherein a controllable heater is arranged adjacent to and in thermally conductive contact with the switch gap.

2. The apparatus as claimed in claim 1, wherein the flux pump and the superconducting coil of the electromagnet are arranged together in a common cryostat.

3. The apparatus as claimed in claim 1, wherein the switch gap is in the form of a thin film.

4. The apparatus as claimed in claim 3, wherein the thin film has a thickness of 0.2 to 2 μm in the region of the switch gap.

5. The apparatus as claimed in claim 3, wherein a current carrying capacity of a cross section of the thin film is at least 10^6 A/cm^2 in the region of the switch gap.

6. The apparatus as claimed in claim 1, wherein the HT_c superconductor material chosen for the at least one controllable switch is a material from the RE BaCuO group, with the RE being at least one of the rare-earth metals Nd, La, Dd, Eu, Sm and yttrium.

7. The apparatus as claimed in claim 1, wherein one of Bi2212, Bi2223, and LaSr-CuO is chosen as a material for the at least one controllable switch.

8. The apparatus as claimed in claim 3, wherein the thin film is applied to a buffer layer for texturing of the thin film.

9. The apparatus as claimed in claim 3, wherein one of polycrystalline ZrO, MgO and glass is provided as a substrate for the thin film.

10. The apparatus as claimed in claim 9, wherein the thickness of the substrate of the thin film is 0.05 to 0.1 mm.

11. The apparatus as claimed in claim 1, wherein the at least one controllable switch is formed on a base plate composed of highly thermally conductive material.

12. The apparatus as claimed in claim 11, wherein a base plate is at least partially copper.

13. The apparatus as claimed in claim 11, wherein a surface of the base plate is provided, at least in the region of the switch gap, with a coating with a thickness and composed of a material such that the coating has a thermal conduction capacity that can be predetermined between the base plate and the thin film.

14. The apparatus as claimed in claim 13, wherein a plastic material is used for the coating.

15. The apparatus as claimed in claim 13, wherein a grease is provided as the coating.

16. The apparatus as claimed in claim 1, wherein the materials and dimensions of materials used for the at least one controllable switch are matched to one another in order that, in a controlled state of a blocking of a current flow in the switch gap, a self-stabilized state of the current flow blocking occurs.

17. The apparatus as claimed in claim 2, wherein the switch gap is in the form of a thin film.

18. The apparatus as claimed in claim 4, wherein a current carrying capacity of a cross section of the thin film is at least 10^6 A/cm^2 in the region of the switch gap.

19. A method of operating a flux pump for feeding current into a superconducting coil of an electromagnet, including a transformer having, on a secondary side thereof, at least one superconducting coil including HT_c superconductor material, at least one controllable switch including HT_c superconductor material and having a switch gap, and a controllable heater arranged adjacent to and in thermally conducive contact with the switch gap, comprising the step of:

feeding current pulses to the transformer of the flux pump.

20. The method according to claim 19, further comprising the step of:

driving the controllable heater with a heating pulse during a duration the controllable switch is in an open state.

21. The method according to claim 19, further comprising the step of:

driving the controllable heater, at a time the at least one controllable switch is in an open state, with a heating pulse having a time duration shorter than a switch phase of the at least one controllable switch, for a controlled reduction of residual current.

22. The method according to claim 21, wherein the controlled reduction of residual current is at least partially brought about by way of respective time intervals in the current pulses fed to the transformer.

23. The method according to clam 22, wherein during the respective time intervals, a magnetic flux in the transformer is kept substantially constant.

24. The method according to claim 19, further comprising the step of:

achieving current stabilization in the electromagnet by controlling the current pulses fed to the transformer.

25. The method according to claim 24, wherein the current stabilization is achieved by controlling the frequency of the current pulses.

26. The method according to claim 24, wherein the current stabilization is achieved by controlling the amplitude of the current pulses.

27. A flux pump and electromagnet arrangement, comprising:

a primary coil having at least one secondary coil; and

at least one switch being operationally associated with the primary coil,

wherein the at least one secondary coil and the at least one switch are at least partially made of HT_c superconductor material.

28. The arrangement according to claim 27, wherein the primary coil includes two secondary coils being at least partially made of HT_c superconductor material.

29. The arrangement according to claim 27, wherein the HT_c superconductor material of the at least one switch is .2 to 2 μm thick thin film having a high current carrying capacity.

30. The arrangement according to claim 29, wherein the high current carrying capacity is at least 10^6.

31. The arrangement according to claim 27, wherein the primary coil has a plurality of secondary coils, each of the plurality of secondary coils being made of HT_c superconductor material.